

Flight

First Aero Weekly in the World.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE AERO CLUB OF THE UNITED KINGDOM.

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MUSCLE MANOR AT SHELLBEACH, SEEN FROM THE FRONT AND THE BACK IN ITS SPRING ATTIRE.—
This quaint old building is the Club House at the Aero Club's flying ground at Shellbeach.

BRITAIN AND THE COMMAND OF THE AIR.

FOR the moment the Government announcement of the formation of a committee of specialists to deal with aeronautics from a national point of view has been useful in serving to draw the attention of all classes in Britain to the importance of the subject. It is an urgent one in other ways than the public may have been led to suppose from sensational articles that have appeared from time to time in sundry organs of the daily press. In a manner, too, practical men who are not necessarily specialists on the subject may be able to appreciate the situation more thoroughly than those who devote the whole of their lives to solving the problems of human flight. Any specialist must necessarily lose a certain amount of perspective the further he goes into his subject. For example, the more he investigates the more he may appreciate the vast amount of work there yet remains to do before we shall have reached the ideal state. Success in life, as in war, however, consists largely in exploiting a suitable series of makeshifts. The fact that we have not a perfect air-vessel either of the lighter or of the heavier-than-air sort at the moment, nor are likely to evolve one for perhaps a generation to come, does not argue that the command of the air is not a matter of vital present importance from Britain's point of view, at any rate. Ideal machines could be employed with equal facility in the most tempestuous, as in the calmest, weathers; present day actual full-scale air-craft can be employed quite effectively in all reasonably calm weathers. From this it cannot be argued that until we are possessed of "all weather air-craft," the matter of aerial supremacy may be considered of no pressing importance. To do that would be equivalent to the conduct of the proverbial ostrich, which buries its head in the sand. To be safe under existing conditions of achievement, the nation would have need of a written guarantee from the elements that any time henceforward when we might be engaged in hostilities with a foreign Power there would never be any calm weather throughout the period of the warfare. If calm days came in any future war aerial craft could be made use of, and from present evidence it is certain that during at least half the days in the year the best types of air-vessels can be employed without risk. In actual warfare chances would be taken, so that it is scarcely an exaggeration to compute that during at least 70 per cent. of the days in any one year air-craft no better than the best of existing types would be employed to assist any Power fighting us even if we do not arm ourselves with machines for similar uses.

One does not need to be an expert on flight to appreciate such an essentially obvious line of argument as the foregoing. Let us take another point of view that is also far removed from theory, and very much concerned with fact. At the moment the attention of the nation is much taken up with the question of *Dreadnoughts*, and doubtless rightly so, but the focussing of argument on that point seems to have enabled another no less important matter to have escaped notice. It is essential that Britain should maintain her supremacy on the seas. We must not overlook the fact, however, that that supremacy can now be threatened from under the waters, and it would appear that in this sphere Britain is certainly not leading the way. Our submarines are approximately three hundred ton craft. The Germans are exploiting submarines of a five hundred ton capacity, fitted with

sleeping berths, and capable of being employed over a correspondingly increased area. Moreover, there is no reason to suppose that the limit, either in regard to size or range of employment of the submarines, has been anywhere near reached. Therefore, we have to make note that by building large lighter-than-air craft suitable for manœuvring in fair weather conditions, and submarines of greater range than our own, Germany—to instance but a single country—is working on the lines of threatening the supremacy of any sea or land power with a much cheaper class of vessel, for, as the most expensive type of *Zeppelin* would not cost more than half the price of a submarine, so a submarine of the largest sort would not cost more than a tenth the price of a *Dreadnought*.

It is sometimes well to glance away from the too-absorbed pursuit of any given subject, and take stock of one or two factors in the situation such as the points that have just been touched on. Such divergencies enable even the least immersed in the busy world's affairs to appreciate that the problem of human flight, which many are apt to regard as a branch of science or of sport alone, is something for which this nation has a very real need in virtue of the importance that is being attached to it by foreign Powers whose destinies are guided by far-seeing intelligences that one would necessarily be wary of underestimating. One great point to appreciate at the moment is that, vast as is the headway that we have lost already, if we set to work actively there is every prospect of its being recoverable at a cost that is a bagatelle by comparison with the importance of the object to be achieved.

A quarter of a million a year spent for ten years on well-directed scientific and experimental work, and on the production of actual machines, would only amount to £2,500,000 in the course of the next decade; yet for that purely nominal sum there is no reason to suppose that we should not be enabled to match the very best in all classes of air-craft that could be produced abroad. The work of actually building and equipping fleets of air-craft on lines which experiments should have proven to be desirable must, of course, be defrayed by other moneys than those spent on experimental research work, and the finding out how to build suitable types. There is some danger that the Government's announcement of an Aerial Committee may lull the public into a false security, because it is obviously undesirable for material details concerning the results of labours to be issued to the world. Consequently, it is well nigh impossible to keep any check on what is being actually done to enable Britain to take her due position in the field of aerial locomotion. The public will only be able to judge by results. But it has a right to know precisely what sums the Government intends allocating to the special work taken in hand. The Premier's statement as to "adequate" funds means nothing at all. No two men's ideas of adequacy in a given direction need be the same. There is absolutely no harm in making the most public possible announcement of the precise sums of money the Government intends to expend during the coming year on aeronautics. Indeed, it is necessary that the minimum amounts to be spent should be named. Elsewhere in this issue we give some interesting opinions from prominent men in the aeronautical world concerning the Government's programme.

GETTING READY AT SHELLBEACH.

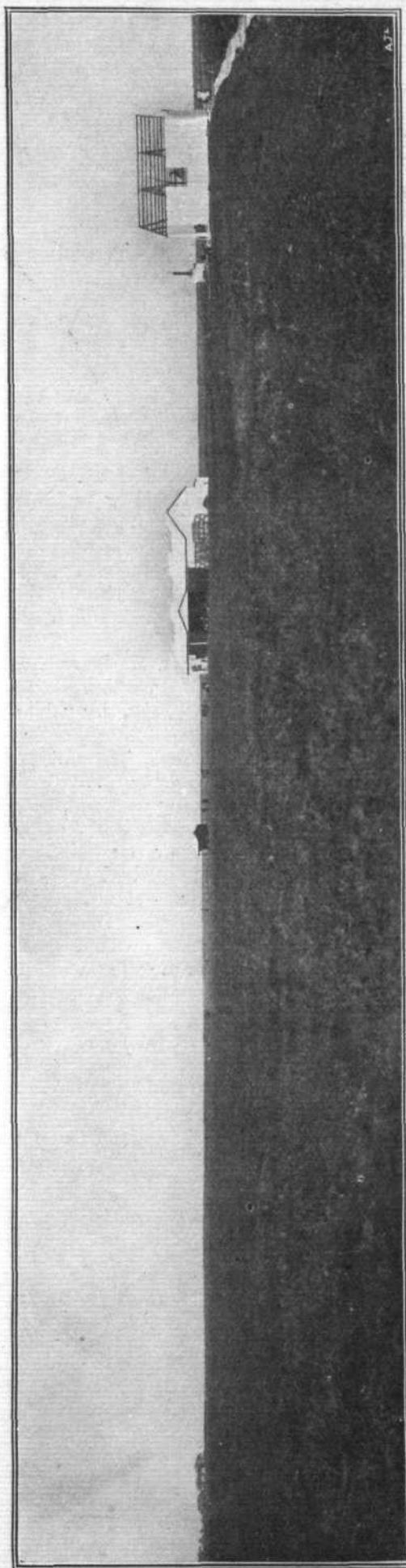
ENGLAND, it has often been said, is apt to be a little slow to move, but it is characteristic of the English race that once they have made a start, no time is wasted, and we fancy it would surprise a good many people to see the extent of the work that has been accomplished on the Aero Club's flying ground at Shellbeach, in the Island of Sheppey.

It is impossible to make any progress in flight unless certain preliminary precautions are taken to reasonably ensure continuity of the experiments to be carried out, and it is therefore useless to build an expensive machine and transport it to some suitable track of land where flights may conceivably be possible, unless provision is made in advance for housing the flyer when it is not in use, and for effecting repairs on the spot. More important than anything else is this last; the question of getting repairs carried out with a minimum of delay and expense. A flying ground is no aerodrome unless it has at least this facility, and consequently not the least interesting feature in the landscape of the Shellbeach expanse is the fine factory which has already been erected for Messrs. Short Brothers, the official engineers.

This factory, which has been erected by Messrs. Harbrow, the well-known specialists in iron buildings, has been put up solidly and with extraordinary despatch, and consequently Messrs. Short Brothers have not only been able to take possession, but have been able to get actively to work well in advance of all other proceedings. Already the building is completely full, and Mr. Short is lamenting that he did not have it made twice as big to start with; in fact, at the first opportunity it is to be extended in length by 100 feet. Inside, facing the enormous sliding doors, which close a vast aperture in the landward wall of the building, is Mr. Moore-Brabazon's "Bird of Passage," now undergoing repairs to rectify the somewhat severe smash-up which it sustained when landing at the end of his otherwise successful flight. The cause of that smash was the slipping of the steering-drum, which, extraordinary to relate, is only clamped to its spindle and is not fastened with any sort of a key. Just prior to landing, the flyer had heeled over, and Mr. Moore-Brabazon endeavoured to right it in the usual way by steering; the pressure on the rudder, however, was sufficient to make the aforementioned drum, over which is wound the tiller rope, slip, and consequently the rudder never answered the helm. The extremities of the main planes were rather badly crumpled up, and two aluminium brackets, which transmit the weight of the machine to the chassis, were broken; these latter are now being replaced by built-up plate brackets of manganese steel, which will be much stronger and very little heavier.

As being incidental to this sort of work, it is interesting to notice among Messrs. Short Brothers' equipment a handy little petrol gas plant for welding. The apparatus is merely a can containing petrol, through which air is blown by a bellows for the purpose of carburation. In a place like this, where there is no main supply of coal gas available, the petrol serves a most useful purpose.

Alongside the "Bird of Passage" is "Leon Dela-grange No. V," which has been acquired by Mr. Pitman; at present, however, the machine has not been put together. The Short aeroplane itself, which will be used by Mr. McClean, is also not yet finished, the surfacing of



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1 PANORAMIC VIEW OF THE AERO CLUB'S FLYING GROUND AT SHELLBEACH.—On the extreme left in the distance is (1) the Club House, Muscle Manor, (2) Mr. Frank McClean's bungalow, (3) the aero-dock and workshop of Messrs. Short Bros., and (4) a couple of the flying machine sheds which are being erected by the Aero Club. All these new buildings have been put up in almost record time by Messrs. Harbrow.



"Flight" Copyright Photo.

Messrs. Short Bros.' Aero-dock at Shellbeach which has been erected by Messrs. Harbrow.—In front are the cars of a few members of the Aero Club during a recent visit.

the planes having caused some unexpected delay. It is some indication of the size of the Harbrow building, which in itself is a measure of the activity taking place, to remark that the Short flyer can be very comfortably accommodated transversely. At the opposite end of the shed, work is in progress on the Wright machines, but so far it is only the component parts of these which are visible.

Adjacent to the Short factory, Messrs. Harbrow have also nearly finished another large building, which will be the Club members' garage, and a fine, lofty, dry "flyer-house" it will make. Near by is a neat little pavilion fitted with a stove and a sink, where, presumably, comforts for the inner man will be available. All these buildings are enclosed, or rather are being enclosed, by a fencing, so that this section of the ground will be kept clear of stray cattle. The site chosen for the buildings is close to the sea, and some couple of hundred yards or so from Muscle Manor—the picturesque old homestead which forms the Aero Club's headquarters. Inland, an expanse of ground covered with coarse tufted grass extends for a great distance, and this is the site on which it is to be hoped many interesting evolutions will be performed in the near future.

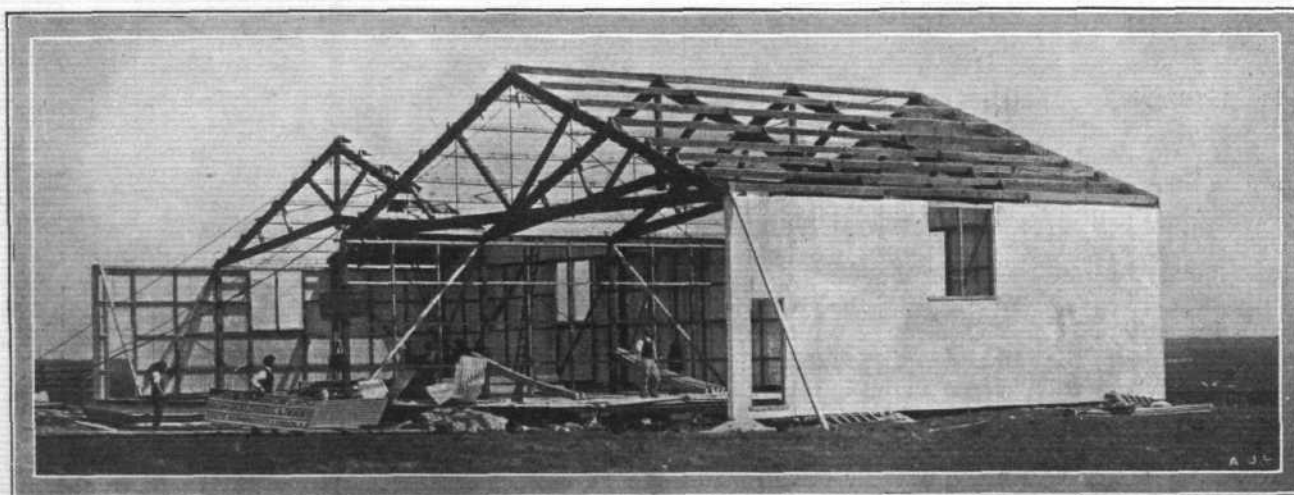
Anyone who, having been somewhat impressed with the general outcry against the unsuitability of most tracts of land for the purpose of flight experiments, goes down

to Shellbeach expecting to find a kind of Brobdingnagian tennis-court, is doomed to disappointment. In its present state, its surface has a good many pitfalls, and it is only necessary to drive a light-sprung car over the track from Muscle Manor to the "enclosure" to appreciate the possibilities of an ill-timed descent with a half-ton aeroplane. Work is in progress, however, which will in course of time remove most of the danger spots from the surface. The natural advantage of the ground mainly lies in its openness, and in the comparative absence of permanent irregularities likely to cause undesirable disturbances in the local atmospheric conditions.

Of the routes to Shellbeach by road, shown diagrammatically in the map published in the last issue of *FLIGHT*, there can be no question whatever of the advantage of proceeding *via* Maidstone to anyone who has the least eye for scenery. It is a longer route than that *via* Chatham, which is thoroughly unpleasant from start to finish. It is also of importance to mention that tarring operations are extensively in progress along the Maidstone road, so that just at the moment it is practically impossible to escape from a spattering of this objectionable adhesive.

A Few Words about the Buildings.

So often is the aviator likely to be confronted in the near future with the necessity of putting up an erection



"Flight" Copyright Photo.

Two of the Aero Club's flight sheds during construction, and which are also being erected by Messrs. Harbrow.

in the wilds far removed from the habitation of man, that a few general particulars concerning the work in which Messrs. Harbrow specialise may be of interest to many readers of FLIGHT. And specialists in the building of sheds, certainly, are the firm of Harbrow, who have constructed at Shellbeach, in the Isle of Sheppey, the Aero Club's hangar and Short Brothers' "flight" factory. What has been done down there is an object lesson, in the first place, of the advantages which accrue to the purchaser from specialisation, for so thoroughly *au fait* is the firm with the exact details of the work which they undertake, that they are able to be really reasonable in their price when circumstances might have led to the anticipation of a costly job.

In the course of their long experience they have extended the nature of their work to an extent which is, of course, wholly inadequately described by the term "shed," but the term is not altogether unsuitable in some respects, for it is to be observed that in nine cases out of ten the man who wants a house for his motor car or accommodation for his flyer thinks of it as a shed in the

first instance, even if a firm like Messrs. Harbrow actually gives him something very much better than he had anticipated for his money. As a matter of fact, Messrs. Harbrow themselves call their structures iron buildings, but neither is this, as they themselves point out, a wholly accurate definition, for they are really composed of timber covered with galvanized iron, lined inside with non-conducting felt, and finished off with match-boarding. Literally their range of utility extends from a kennel to a country residence, and at the same time that the motorist or aviator is having his garage put up, he can, for an equally moderate sum, have a very commodious bungalow erected on the spot alongside it. Of course, it is mainly those engaged in this latter pursuit of flight who would be likely to select the site for the domicile *after* they had pitched upon a likely spot for the accommodation of their machine, but if aviation becomes popular, it may not be many years before little colonies of "flight bungalows" spring up behind the "aero-sheds" on the borders of the great flight lands.

FLIGHT SPEEDS OF THE FUTURE.

SPEAKING before the Royal Society of Arts on Monday evening, when he delivered the last of his three Cantor Lectures on Aerial Flight, Mr. F. W. Lanchester touched upon an aspect of the problem which reflects a very important light upon its future. Starting from the point of view that a flying machine must in the end, whatever its intermediate stages, hold its place by virtue of its utility as a vehicle of locomotion, Mr. Lanchester proceeded to show how its sphere in competition with other means of progression is strictly defined by its speed capabilities. The road vehicle and the ship both do their work with greater economy than is possible with a flying machine, hence there would be no point in using the air if the earth or the sea are available, unless an increased speed were thereby obtained.

Nor is this the only reason why high speed should be associated with the flying machines of the future. Any

machine in the air has to contend with the wind, and while its effective speed as a vehicle of transport is its velocity relative to the earth, its capacity for speed is relative to the air in which it flies. Consequently, unless designed for flight at speeds superior to those of ordinary winds, it could only have a very limited utility.

There is still one further point which makes high speed desirable, and that is the automatic stability which it confers on a machine in the presence of wind gusts. Mr. Lanchester showed by means of certain diagrams, and it can otherwise be demonstrated by models, that a gust of wind contrary to the direction of flight menaces the stability of the machine if the gust approximates in velocity to half the velocity of the machine itself. If, therefore, the machine is to be stable in a gust of 30 miles an hour, which might be quite reasonably expected, it should fly at a speed of not less than 60 miles an hour.

GOVERNMENT COMMITTEE SITS.

THE first meeting of the new Government Advisory Committee was held at the War Office on Wednesday last, when there was a full attendance. Lord Rayleigh, the president, took the chair. Although the sitting lasted

over three hours, only the methods of procedure were discussed. Mr. F. J. Selby, of the National Physical Laboratory, has been appointed Hon. Secretary to the Committee for the present.

SPREADING THE MOVEMENT.

Too much stress can hardly be laid upon the advantages which are likely to accrue from the spreading of a definite interest in flight in the minds of the general public, and it is with the greatest satisfaction that we learn of lectures on aviation being delivered in almost unexpected quarters. There is, of course, the strongest and most direct of ties between flight and natural history, for it is, after all, the birds that show man that the conquest of the air is possible.

On Friday evening of last week, when the Selborne Society—which was founded in 1885 to perpetuate the

memory of Gilbert White, the author of the celebrated "Natural History of Selborne"—held its Annual Conversazione, the principal items on the programme were two lectures entitled "How Birds Fly" and "How Men Fly," by Mr. F. W. Headley, F.Z.S., and Mr. T. W. K. Clarke, B.A., respectively. Both lectures were illustrated by lantern slides, and Mr. Clarke demonstrated some of his remarks by models. Mr. Headley's set of illustrations were of exceptional interest, alike to students of natural history and to those engrossed in the study of human flight.

BACK NUMBERS

OF "FLIGHT."

THE publishers have pleasure in announcing that they have secured a few of the back issues of FLIGHT, and any of our new readers who may wish to complete their sets may obtain the first nineteen numbers for 2s. 6d. post free, from the Publishers, 44, St. Martin's Lane, W.C.

AERO CLUB OF THE UNITED KINGDOM.

OFFICIAL NOTICES TO MEMBERS.

Fixtures for 1909.

May 22	...	International Balloon Race, Hurlingham Club.
June 23	...	Balloon Race, Hurlingham Club.
July 10	...	Balloon Race, Hurlingham Club.
July 17	...	Balloon Race, Hurlingham Club.
August 28	...	Gordon-Bennett Aviation Cup, Rheims.
October 10	...	Gordon-Bennett Balloon Race, Zurich.

Committee Meeting.

A meeting of the Committee was held on Tuesday, the 11th inst., at 166, Piccadilly, W., when there were present: Mr. Martin Dale in the chair, Mr. Griffith Brewer, Mr. Ernest C. Bucknall, Vice-Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O., Mr. John Dunville, Earl of Hardwicke, Prof. A. K. Huntington, Mr. V. Ker-Seymer, Mr. F. K. McClean, Mr. J. T. C. Moore-Brabazon, Mr. C. F. Pollock, Hon. C. S. Rolls, Mr. Stanley Spooner, Mr. R. W. Wallace, K.C., H. E. Perrin (Secretary).

New Members.—The following new Members were elected:—

J. D. F. Andrews.	A. Ogilvie.
S. Benjamin.	Harold Piffard.
Claude A. Bettington.	Herbert Reed.
Gerald Biss.	Martin D. Rucker.
Mrs. Ethel A. Claudet.	Edwin O. Sachs.
Arthur C. Claudet.	Capt. E. F. F. Sartorius.
Hon. Thomas Cochrane, M.P.	G. H. Smart.
Capt. J. H. Davidson-Houston.	W. H. R. Streatfeild.
Dr. H. S. Hele-Shaw.	William P. Thompson.
A. C. Moreing.	Arthur Wright.
E. de C. Oakeley.	

International Balloon Race, Hurlingham.

The International Balloon Race will take place at Hurlingham Club, Fulham, S.W., on Saturday, May 22nd, 1909, at 3 p.m.

Members of the Aero Club will be admitted to the Hurlingham Club free on presentation of their Aero Club Membership Cards.

Members of the Aero Club can obtain special tickets for the admission of their friends, who are not members of the Aero Club, to Hurlingham, from the Secretary of the Aero Club, price 10s. each.

The following entries have been received to date:—

C. F. Pollock	...	Valkyrie	...	England
Griffith Brewer	...	Lotus I	...	"
Hon. C. S. Rolls	...	Mercury	...	"
John Dunville	...	Banshee	...	"
Philip Gardner	...	Kismet	...	"
Ernest Bucknall	...	Enchantress	...	"
V. Ker-Seymer	...	La Mascotte	...	"
Capt. A. H. W. Grubb, R.E.	...	Venus	...	"
C. A. Moreing	...	Thistledown	...	"
Major Sir A. Bannerman, Bart.	...	Satellite	...	"
Dr. F. Linke	...	Ziegler	...	Frankfort, Germany
Dr. Hütz	...	Moenus	...	"
Direktor Neumann	...	Tillie	...	"
H. Demoor	...	Aero Club IV	...	Belgium

Competitors are requested to advise the Secretary of the Aero Club of the names of their passengers on or before Tuesday, May 18th, 1909.

Passengers in the balloons, not being Members of the Aero Club, will be supplied with free vouchers admitting them to Hurlingham, on application to the Secretary of the Aero Club.

New Club Balloon.

The Aero Club have acquired a new Club balloon, 50,000 cubic feet capacity. This balloon will follow the International Balloon Race on May 22nd at Hurlingham, and Members wishing to make the ascent are requested

to notify the Secretary at once. The fee will be £4 per person, and the three seats available will be allotted in order of receipt of application.

Flying Ground at Shellbeach.

Railway Arrangements.

The South-Eastern and Chatham Railway Co. have agreed to allow members of the Aero Club and Aero Club League visiting the flying ground at Shellbeach reduced fares, as under:

1st Class Return	2nd Class Return	3rd Class Return
8s.	6s. 6d.	5s.

These tickets will be available for one month from date of issue.

Members desiring to avail themselves of these reduced fares are required to produce vouchers at the booking offices. Vouchers can be obtained from the Secretary of the Aero Club.

Trains leave Victoria, Holborn, or St. Paul's.

For the convenience of members, the best train is the 9.45 a.m. from Victoria, arriving at Queenborough 10.55. At Queenborough change to the Sheppey Light Railway for Leysdown (Shellbeach), which is $\frac{3}{4}$ -mile from the flying ground.

S.E. and L.C. and D. Railway Bill.

Before a Select Committee of the House of Lords, the Petition of the Royal Automobile Club against the above Bill was heard last week. The Petition, which was supported by the Aero Club, asked for a reduction of the toll of 1s. 6d. each way at present charged for motor cars passing over Swale Road Bridge, which is the sole connecting link between the Island of Sheppey, where the Aero Club's new flying ground is situate, and the mainland.

Unfortunately, the House of Lords Committee refused to reduce the toll, and the question of making a further effort to get the toll reduced by petitioning in the House of Commons is now being considered.

Balloon Photographs.

The Committee of the Aero Club have awarded the Bronze Medal for the best photographs taken from a balloon during the year 1908, to Dr. W. J. S. Lockyer.

Frankfort Exhibition.

It is proposed to organise an English day for balloon competitions in connection with the Frankfort Exhibition, and the date suggested is between September 3rd and 7th next.

The Exhibition authorities will provide free gas, and two or three balloons will be placed at the disposal of the English competitors. Three cups of the total value of £100 will be offered as prizes. Members of the Aero Club wishing to take part should communicate with the Secretary.

Travel Exhibition.

Members of the Aero Club and the Aero Club League wishing to exhibit model flying machines in connection with the Aero Club exhibit at the Travel Exhibition in July next are requested to notify the Secretary of the Aero Club as soon as possible. *Space and stands will be provided free of charge.*

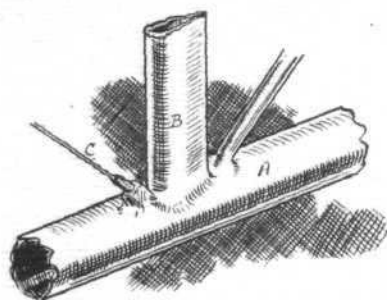
HAROLD E. PERRIN, Secretary.

The Aero Club of the United Kingdom,
166, Piccadilly, W.

JOINTS AND FASTENINGS.

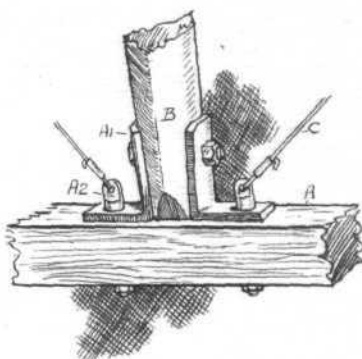
EXAMPLES OF SOME INTERESTING LITTLE CONSTRUCTIVE DETAILS WHICH MAY BE SEEN ON AEROPLANES.

To those unacquainted with actual workshop practice, the construction of a machine like an aeroplane may seem straightforward enough, and it is probable that many casual observers have far too little appreciation for the ingenuity displayed in the design of their details. Yet, in practice, it is precisely the details which take the time. One piece has to be fastened to another, and the question at once arises how the joint can be best effected in the easiest and cheapest way.



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Welded joint on Howard-Wright biplane.

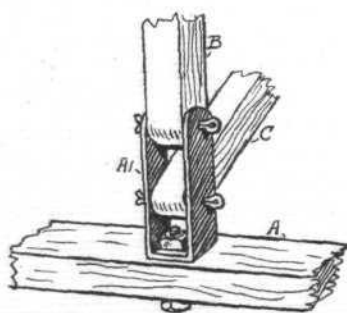
At the same time a decision has to be arrived at as to whether the joint in question must be essentially strong, or whether



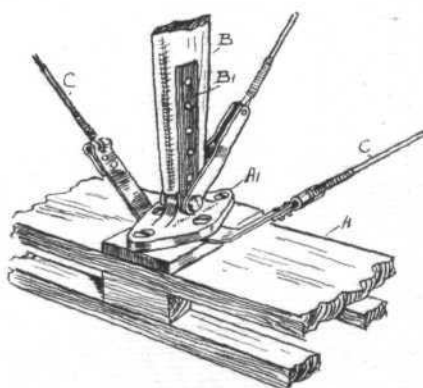
"Flight" Copyright.
T-joint in Capt. Windham's Pischoff.

perchance the attachment may be regarded as something of a casual nature. In engineering pure and simple, it is, perhaps, needless to say, joints of this latter character are unknown in principle, and are happily seldom to be observed in practice; in aeroplane construction it is more than likely that the same state of affairs will ultimately evolve, but at present it is only fair to remark that not everyone acts up to this principle at the present day.

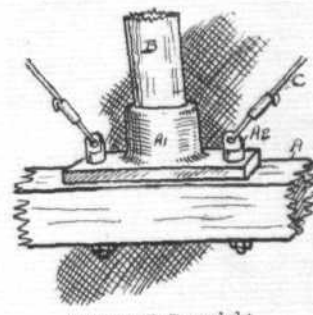
In the accompanying sketches will be found examples of a few details which serve very well as a



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Lamplough's flexible fastening.



"Flight" Copyright.
Short's flexible fastening.



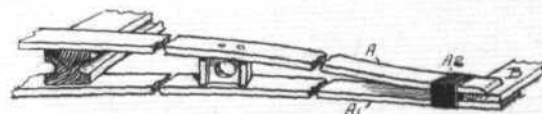
"Flight" Copyright.
Rigid socket-joint on the Voisin flyer.

the tension wires, C, are also fastened solid into the same joint. Properly executed, such construction is, of course, simple and strong, and the joint itself is characterised by great rigidity.

When considering the other examples afforded by the accompanying sketches, it is necessary to make a preliminary classification of great importance. Some makers, it will be found, purposely design such joints so that they are naturally flexible, while others make them so that they are essentially rigid. It is to the former class that the Wright flyer belongs, and British-made machines which follow the same principle include the

Short and the Lamplough. The Voisin flyer has rigidly-attached struts, and in Captain Windham's Pischoff the intention is also apparently to give a rigid effect, although the detail of the joint in question is not such as to make this quality inherent to the same degree.

The joint on the Short flyer is particularly interesting for the evidence of careful thought which has been given to its design. The main horizontal-member, A, to which the strut, B, is attached, is fitted with an aluminium lug, A¹, screwed in place by four wood screws, and it will be noticed that the flange of this lug has been employed as a clamp for fastening a light steel strap to which the diagonal tie-wires, C, are secured. Inserted in the faces of the strut, B, are a pair of steel fitch-plates, B¹, which project beyond the extremity of the wood, and themselves serve to



"Flight" Copyright.
Short's flexible rib.

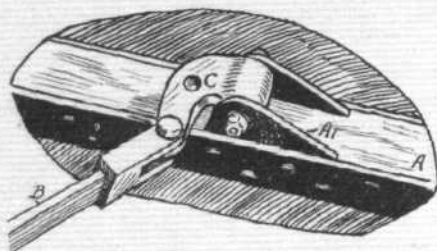
basis of comparing present day methods. For the most part the illustrations represents joints between vertical struts and horizontal spars, the former being principally employed in the separation of the two main planes of a biplane, and the latter constituting either of the main-transverse members which run through the planes in question. For the most part, as our readers are aware, wood is used as the material of which these members are made, an interesting exception being the case of the Howard-Wright biplane, in which tubular steel work is used throughout. As our sketch of the joint on this latter machine shows, the tubes, A and B, are welded together, and not only so but the eye-pieces for the attachment of

form the hinged joint with the lug, A¹. The pin which completes this joint also serves, it will be noticed, as an anchorage for a third diagonal tie-wire.

Another example of flexible construction is that afforded by the Lamplough machine, in which a vertical wood strut, B, and also another wooden member, C, placed diagonally, are required to be attached to a main-spar, A. In this case it will be noticed that a steel U-piece, A¹, has been bolted to the spar, A, and that the other members, B and C, are fastened to this steel stirrup by means of split-pins. Subjected, as it probably would be, to a racking strain, owing to the exigencies of experimental work, it would conceivably enhance the

longevity of a joint of this description had the members, B and C, been themselves faced with steel so to prevent the split-pin cutting into the wood.

In the Voisin flyer, which is an example of rigid construction, the attachment of the vertical-strut, B, to the horizontal-spar, A, is accomplished by means of an



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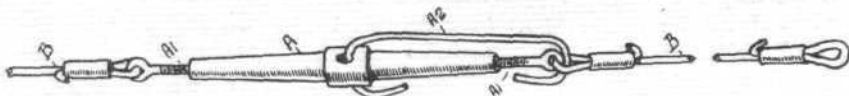
A detail on the Rep monoplane.

aluminium socket, A¹, which is fastened to the spar itself by two bolts, A². The heads of these bolts, it will be noticed, are used as eye-pieces for the

attachment of the diagonal stay-wires, C, which, by the way, would seem to be in a position to exert an appreciable leverage upon the bolt-heads. On Captain Windham's Pischoff, the socket is replaced by a pair of angle-brackets, A¹, which are similarly fastened to the main-spar, A, but have, of course, to be bolted to the vertical strut, B, in addition. As a result, it is not so simple a job to make a really rigid connection, although the method doubtless lends itself to cheap construction.

Some other details not related to the particular type of joint which we have just discussed, are also included among the accompanying sketches, one of which, for instance, shows a little detail in the construction of the Rep monoplane. It illustrates a connection between a rectangular steel tie-rod, B, and a main spar, A, which is carried out by means of a swivel, C, carried on a bracket, A¹, formed by steel flitch-plates screwed to the main spar itself. This particular joint is one used in connection with the warpings of the wings, but as a detail of construction it is, of course, not limited to this particular application.

Another little device initially designed for a special purpose, but which might conceivably have extended utility, is the flexible rib on the Short flyer. It is a feature of the Short construction that the surfaces of their main planes are as rigid and exact in contour as they can possibly make them. On the other hand, however, it will be recollected that their machine embodies rearward extensions of the main-plane in the form of "lips," which can be flexed on either side of the neutral stream line for the purposes of righting and steering. One of the accompanying sketches shows how this flexibility is obtained. The top and bottom laths, A and A¹, which



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Adjustment for tightening stay-wires.

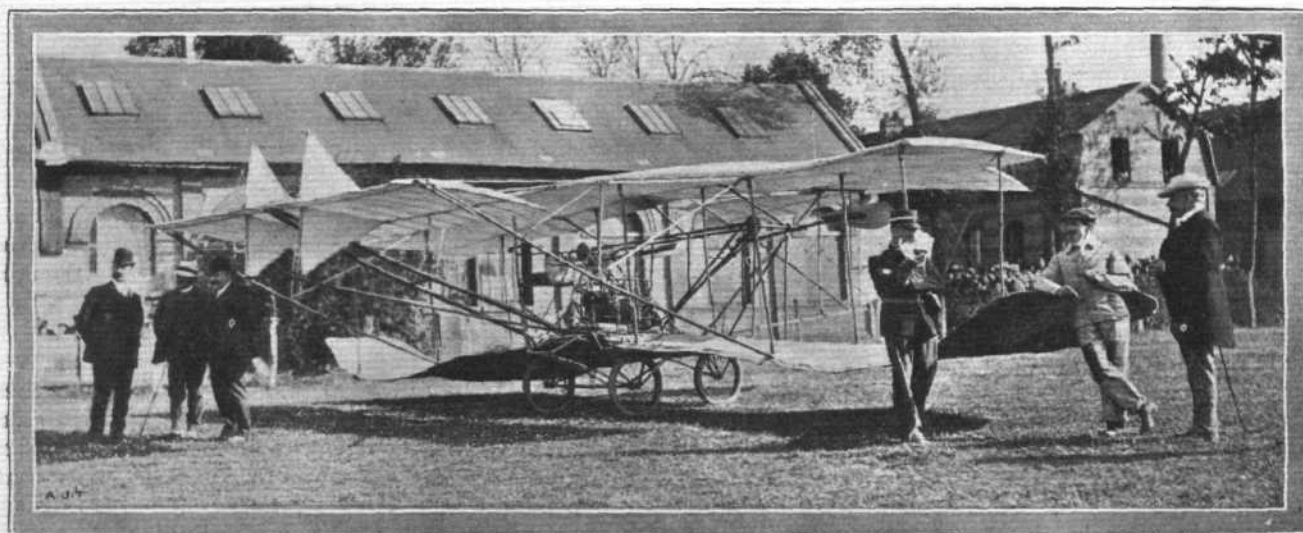
form the rib, are caused to grip the transverse-lath, B, which forms the trailing edge of the lip in question, by means of a light steel band, A². This is so arranged that when the lip is flexed up or down the laths can accommodate themselves by sliding into their natural positions without in any way disturbing their joint with the rear edge.

Mention has already been made of the fact that while some constructors believe in tight bracing, others use comparatively slack wires. In the former case it is commonly considered desirable to afford some means of keeping the wires taut, and of readily adjusting them. The device for doing this is in most cases a simple barrel nut, such as that illustrated, in which the wire, B, is divided and attached to a pair of right and left-handed steel screws, A¹, which engage with the nut barrel, A. Through the centre of the nut a hole is drilled so that it can be conveniently turned by the use of a "tommy-bar," and the same hole serves for locking the nut by means of a piece of wire, A², arranged as shown in the sketch.

"Army Dirigible II."

TRIALS were made at Farnborough on Tuesday and Wednesday last with the new Army dirigible. Only short flights were made, that on the first day lasting for about

an hour, but on the second day it was noticed that a steady sail had been fitted beneath the balloon. As far as could be judged the trials were satisfactory, although no information was divulged officially.



Latest form of the Robart biplane which is fitted with an 8-cyl. 50-h.p. Antoinette motor, chain transmission and two propellers. It has a span of 12 metres, and a plane surface of 52 sq. metres. The feature of this aeroplane is the pronounced curvature of the lower plane.

THE NEW BRITISH FLIGHT OFFICE.

PARTIAL SATISFACTION IN AERONAUTIC CIRCLES.

OPINIONS very naturally differ a good deal concerning the probable efficacy or otherwise of the recent step taken by the Government for affording official encouragement to aeronautic progress in this country. As yet so little is known concerning the precise powers, scope, and resources of the newly-appointed Committee, and of those departments to whom they are to act in an

MR. EDWARD P. FROST, President of the Aeronautical Society of Great Britain:—

"England, which should lead the way, as she has done for a century past, in modern science and mechanics, now being lamentably behind other nations in aeronautics generally, has adopted a scheme which should help materially military aeronautics, at any rate.

"The scope for activity on the part of the Special Committee should be towards the development of aeronautics generally, in order that every encouragement should be given to individual effort, for where there is the largest brain power and ingenuity there is often insufficient funds to develop inventions. Hence the need of judicious State assistance, and it may be hoped that ample funds are available to enable this great nation to regain and retain a substantial lead."

Col. J. D. FULLERTON, R.E., Hon. Secretary, Aeronautical Society of Great Britain:—

"The Government Programme.—The general idea seems to be to establish a sort of central experimental and investigation department in London, and to carry out outdoor experiments at the military and naval depôts at Aldershot and Portsmouth. Such an organisation will do well enough for the present, but it is obvious that the National Physical Laboratory, which already has a large amount of scientific work to do, cannot possibly carry on the difficult and complicated work of aeronautical investigation indefinitely.

"An experimental depôt entirely under the control of what may be called the 'Air Forces' (as opposed to the 'Land' and 'Sea' Forces), will in the near future be an absolute necessity, and the sooner this is realised, the better for the country.

"As regards the actual work done at the laboratory, I think this should be considered confidential, and that the results obtained should *not* be communicated to the world at large. Work of this kind, if properly carried out, is very expensive, and it is not desirable that foreign nations should get the benefit of the money expended by us on this subject.

"Scope of the Committee's Activity.—On this point, nothing appears so far to be settled; but naturally the work would be more or less of the following nature:—

"1. Experimental work, testing the effect of the air on bodies, surfaces, &c. Experiments with propelling apparatus, &c.

"2. Theoretical work, on the motion of bodies, &c., principles of stability, and so on. (This would, of course, be done in conjunction with the experimental work.)

"3. Design of models and full-sized machines of moderate weight in conjunction with the officers in command of the aeronautical depôts.

"Lines for the Committee to Work Upon.—It is somewhat difficult to give an opinion on this point. The members of the Committee are all very busy men, with a great deal of work of their own to do, and the method of procedure will really depend upon what time they can spare for the Committee's work.

"Speaking generally, the best course would be to—

"1. Thoroughly study the present position of aeronautical science.

"2. Arrange and generally supervise the work to be done at the National Physical Laboratory.

"3. Visit the military and naval depôts, examine the work in progress, &c. I attach great importance to this, as it is most desirable that the officers who are actually doing the work should have ample opportunity of personally explaining their requirements to the members of the Committee.

"As regards the composition of the Committee, Lord Rayleigh and Dr. Shaw are both members of the Council of the Aeronautical Society of Great Britain, and are therefore well acquainted with aeronautical progress. Mr. Lanchester has written a very useful book on the subject, but the rest of the members, as far as I am aware, have no aeronautical experience. These latter gentlemen are, however, all well-known scientists, and will no doubt do their

advisory capacity, that much depends upon individual ideas as to exactly what is intended. The whole question is of such burning importance to the prospects of the movement that the following opinions, which have been sent us by leading men in the aeronautic world, are of no small amount of interest:—

best to carry out the objects for which the Committee has been appointed.

"Nature of the Earlier Investigations.—The first and foremost thing to be done is to design and construct the testing apparatus and the buildings necessary for housing it. This may seem to be a simple matter, but, as a matter of fact, this all-important work is very difficult, and requires an immense amount of time, care and forethought.

"The next most important thing is to carry out the tests of the bodies and surfaces likely to be used in aeronautical work, and when this is completed the question of equilibrium should be thoroughly gone into.

"The above are the matters requiring immediate attention, but a host of other questions, such as the design of propellers, the best kinds of motors, &c., are awaiting investigation, and should be gone into as soon as time and funds are available.

"Funds.—No information is at present available as to the amount of money to be granted for the use of the Committee, but it is quite clear that if good work is to be done ample funds must be placed at Lord Rayleigh's disposal.

"Few people are aware how very expensive experimental work of this kind is, and it is not too much to say that the chief reasons why Great Britain is behind other countries in aeronautical matters are that money has not been available for effective experimental work, and that those who have endeavoured to develop the scientific side of the question have never received that support from their countrymen to which they were entitled.

"It is, of course, difficult to estimate the sum which should be allowed for the use of the Committee, but probably the following will be required for the present year:—

National Physical Laboratory	...	...	...	£ 20,000
Military Depôt, Aldershot	...	...	...	20,000
Naval Depôt, Portsmouth	...	...	...	20,000
Total	...	...	...	60,000

"In connection with this, it may be pointed out that Prof. Langley's experiments (which are generally considered to be the standard) cost £10,000, and that though they were of what might be called an elementary nature, he considered that he required at least another £10,000 to complete them.

"Concluding Remarks.—In conclusion, I should like to draw your attention to two most important questions which should be thoroughly investigated by the Committee. They are:—

"1. The formation of 'Air Forces' on the lines of the present 'Land' and 'Sea' Forces.

"In my opinion this should be taken in hand as early as possible, as it is quite out of the question for the work of a fighting force to be properly done if the fast-moving 'Air Forces' are to be tied down to the slow-moving 'Land' and 'Sea' Forces.

"2. Whether it is really desirable to construct any 'lighter-than-air' machines.

"I am strongly opposed to the construction of such machines. They are heavy and cumbersome, very difficult to manage in even moderately bad weather, and for their size, carry a very small amount of useful weight. Their speed, also, except in light winds, is indifferent; they are very costly, and, taking everything into consideration, such machines are not, in my opinion, worth the heavy expenditure which their construction and housing involves."

The Hon. C. S. ROLLS, Committee, Aero Club of the United Kingdom:—

"I should describe it as an invaluable move in the right direction. I have for some years past ventured to urge the Aero Club to establish a laboratory and to appoint a sub-committee to investigate inventions and carry out experiments.

"In view of the perfection to which the Wright aeroplane has been brought, it would, I think, be a waste of time for the Committee to

concern themselves with any actual designing or construction of aeroplanes, and their principal functions will be the testing of special kinds of material suitable for aeroplanes and dirigible balloons, and the testing of any particular devices which may be submitted by other inventors, also the obtaining of a standard set of data, or tables, relating to such things as the thrust of propellers of different pitches.

"For such laboratory work as the above, the Committee seems well constituted; but the absence of aeronauts or men with practical experience would be found a weak point in its constitution should it at any time undertake the actual designing or construction of complete aeroplanes.

"I think there is no doubt that it is now intended that ample funds shall be available for the work in this country."

Mr. J. T. C. MOORE-BRABAZON:—

"The constitution of this body seems to contain the names of men who are eminent from a scientific point of view. Whether it will be possible for them to arrive at any practical results the future will alone decide.

"If good wishes will do this body any good, then their success is assured.

"The practical side of aeronautics is, in my opinion, as valuable as the scientific, therefore I hope that this Committee will keep its eyes open to the private endeavours that are being made in this country, and that, in the absence of the practical element on this body, they will keep themselves *au courant* with results attained at Sheppey."

Mr. V. KER-SEYMER, Committee, Aero Club of the United Kingdom:—

"The appointment of a committee composed of such diverse and profound scientific attainments leads one to suppose that their duties will be limited to matters of a purely theoretical nature. Should any other programme be contemplated, it is to be hoped that this Committee will co-opt someone possessing practical and first-hand knowledge of aviation as practised in other countries.



NEWS OF THE WEEK.

Aerial League in Liverpool.

ON Monday a very enthusiastic meeting, under the auspices of the Aerial League, was held in Liverpool. The chair was taken by the Lord Mayor, and he was supported by many prominent citizens, including Sir Alfred Jones, President of the Chamber of Commerce. Addresses were delivered by the Lord Mayor, Col. Massy, Lady O'Hagan, and Mr. W. H. Lever.

Wright Brothers in America Again.

WHEN the Wright Brothers arrived at New York on Tuesday last they were met by a deputation from the American Aero Club and given a very warm welcome back to their native land. After attending a luncheon given by the Aero Club on the following day, they hastened to their home at Dayton, where they at once set to work to get ready the machines for the U.S. Government. It is hoped that the machines will be ready by the middle of June, and will probably be operated by Mr. Wilbur Wright.

"Bleriot XII."

IN a fortnight, at the latest, M. Bleriot hopes to be able to take the air on his new monoplane "No. XII." This is a good deal larger than its immediate predecessor "No. XI," for it has a lifting surface of 22 sq. metres, while the length is 8.5 metres, and the spread of the wings 9.5 metres. The propeller will be 2.5 metres in diameter, and will be driven at 700 r.p.m. by a chain from a 35-h.p. water-cooled E.N.V. engine. The machine will weigh 80 kilograms. "light."

At the rear end of the machine, in addition to a fixed horizontal plane, there will be a movable horizontal plane and the vertical rudder.

A knowledge, and above all practical experience of the construction and working of the petrol engine as applicable to airships and aeroplanes—by no means the least important factor in mechanical flight—is also most necessary, and in this respect the constitution of the newly-formed body appears somewhat lacking."

Mr. STEPHEN A. MARPLES, Secretary of the Aerial League of the British Empire:—

"From the purely national defence point of view of the advance of aerial navigation (as distinct from the industrial and sporting branches, which do not appear to come within the scope of the scheme), Lord Rayleigh's Special Committee is excellent as a first stage.

"There are two sides to the question—the theoretical and the practical—which are mutually dependent upon each other for real progress. In the steps that have been taken, a start has been made on sound lines. The Committee form an excellent 'nucleus crew,' so to speak. It provides the skeleton of a system whereby research work can be properly co-ordinated and organised within a central institution, thus placing the matter upon a scientific and theoretical basis at the outset. Adequate funds, however, must be provided for acquiring the necessary machinery for conducting experiments, and for obtaining the assistance of practical men.

"There are many questions which present themselves: Will the members of the Committee give their whole time to the work? What amount of money is to be placed at their disposal? Will they be empowered to carry out practical tests in full-sized machines?

"Upon these and other matters the answers to your inquiries almost entirely depend, and I hope that the authorities will shortly give further details. For the present, the fact that the Government recognise the supreme importance of theoretical and research work, which I have advocated for some time, is a considerable gain. The Government have put into the question the thin end of the wedge—public opinion must help to drive it home. The Aerial League will continue to be the motive power of public opinion on this particular branch of the subject."

M. Delagrange to Fly in Belgium.

M. DELAGRANGE has made an agreement with the Liege-Spa Aero Club to carry out a series of flights on his Wright flyer on June 11th, 12th, 13th, and 14th. The Club is now faced with the problem of finding a flying ground for him. It is possible that permission may be obtained to use the military plain at Bressoux, but, on the other hand, there is a strong feeling that the flights should be made in Brussels.

Wright Flyers in Germany.

AMONG the rumours which are abroad as to the disposal of the Wright patents in Germany, is one to the effect that Captain Koelher, who had several flights with Wilbur Wright at Rome, is endeavouring to secure the German patents at a cost of about £20,000, for the Motorluftschiff Studien Gesellschaft, of which Herr Lœwe is at the head.

Wright Flyer for the War Office.

A WRIGHT flyer should very soon be seen at Aldershot, for the Hon. C. S. Rolls has generously placed his machine at the disposal of the War Office. A shed is being erected for it by the military authorities, and a suitable ground for testing purposes has been provided.

Lieut. Calderara's Accident.

FROM further information which has been received from Rome, it would appear that the accident was caused by the officer becoming dizzy and relinquishing his hold of the controlling-levers. Bad weather had rendered it impossible for any experiments to be carried out on Tuesday and Wednesday of last week, but on the Thursday morning Lieut. Calderara, although he was not

feeling very well, determined to make an ascent. He had arranged to take a passenger with him, but in view of a high wind which was blowing he decided to go up alone. Several evolutions were carried out very successfully, when suddenly the machine was seen to heel over very much to the right and then fall to the ground. Ready helpers were speedily at work extricating the Lieutenant from the wrecked machine, and he was conveyed to the Villa Cellere, where he was confided to the care of the doctors. It was found that he had dislocated his left shoulder, there were contusions of the right knee and shoulder and a number of other bruises. He is now located in the military hospital at Celio and is progressing so favourably that the doctors hope he will be quite well in a month's time. He has been visited by the King of Italy, who conversed with him for quite a long time and urged Lieut. Calderara to continue his flying as soon as he is well enough. Admiral Mirabello, the Minister of Marine, and the Mayor of Rome have also been among the visitors.

The machine was considerably damaged as a result of its sudden fall, the rudders and one of the wings bearing the brunt of it. Repairs are now being made by military engineers, under the superintendence of Lieut. Savoia, and it will not be long before the flyer is ready to take the air again. The motor was practically unaffected and remained running after the accident.

Opening of Juvisy Aerodrome.

THE Société d'Encouragement à l'Aviation have settled upon May 23rd as the date for the opening of the aerodrome at Juvisy, and by way of providing a programme the Prix de Lagatinerie has been set down for competition on that date. This prize, value 5,000 francs, will be awarded to the aviator who makes the best time over a distance of 12 kilometres. The course will be marked

out by two posts placed 600 metres apart, and each competitor will have to make ten circuits. He will be allowed 15 minutes in which to get into full flight, and should he not be ready to start at the end of that time he will have to give way to the next entrant. Should no competitor succeed in making the full course, the winner will be the one covering the greatest distance. Apparently any machine which touches earth during its run will not be disqualified. Entries close on the 17th inst., the fee being 100 francs, returnable to actual starters, and already nine entries are announced, including two Wright flyers by the Société Ariel, one by M. Delagrangé, two Pischoff-Koechlin machines fitted with Gyt motors, one entered by M. Pischoff and the other by M. Koechlin; two Farman machines by M. Raoul des Vallières and M. Henri de Puybaudet, a monoplane by M. Louis Bleriot, and a biplane made by the Société Française d'Aéroplanes de Savigny-sur-Orge. It is probable that Rougier will also enter his Voisin biplane.

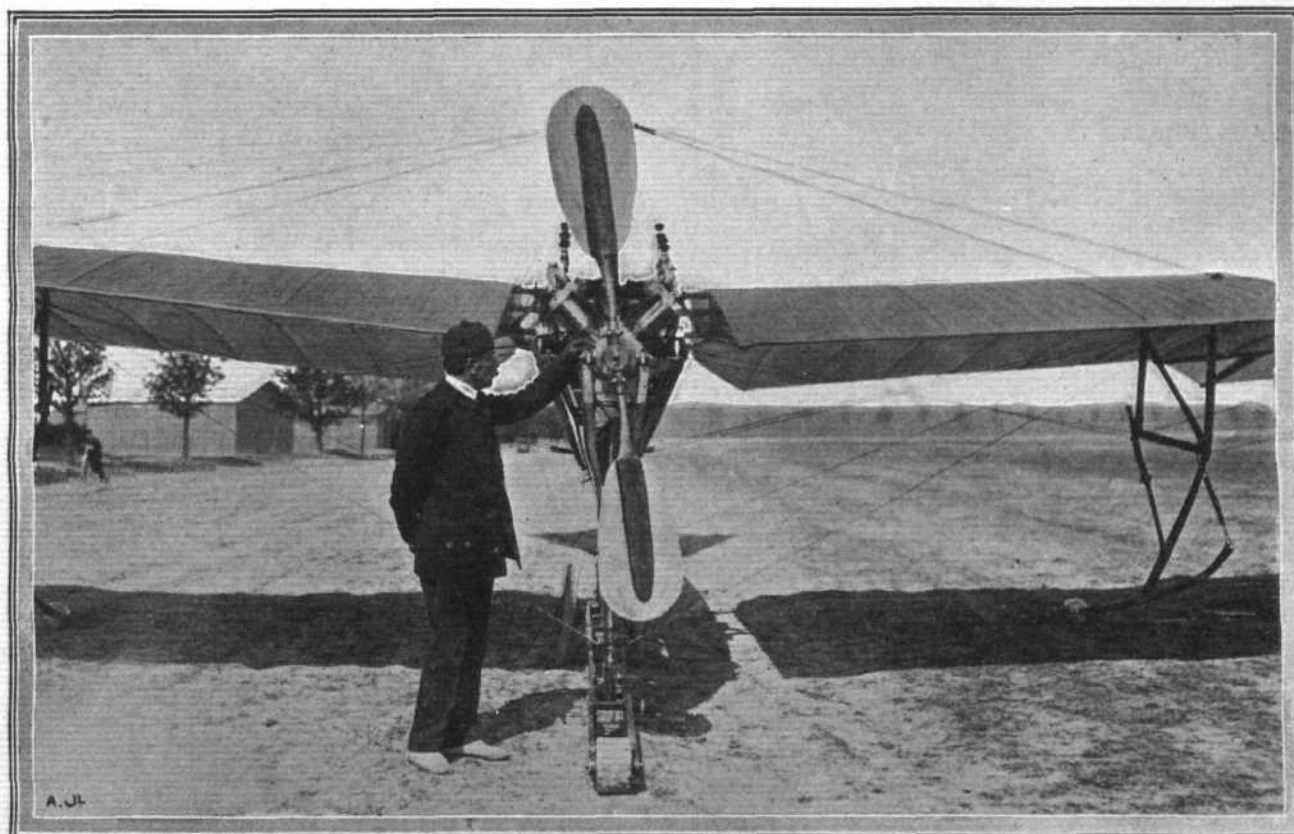
M. Goupy is now at Juvisy, and intends to continue his experiments there with his machine; and M. Lejeune is having a new motor fitted to his latest biplane before attempting further flights.

A Prize at Cannes.

A PRIZE of 2,500 francs has been offered by the Town Council of Cannes for the first aviator who shall fly 50 kiloms. over the Napoule racecourse before the end of the present month.

New Prizes for Douai.

THE Douai Section of the Ligue Nationale continue to receive a great amount of help in connection with the meeting they are to hold from June 28th to July 18th. M. Bocquet de Vimy has offered a prize of 1,000 francs for the first aviator who shall leave the aerodrome at Douai and land in his property at Bois, near Arras, at



ANTOINETTE MONOPLANE.—View, from behind, showing the propeller and the spring framework and wheels attached to the wings. These serve the double purpose of keeping the machine on the level keel when on the ground, and absorbing any shock when alighting after a flight.

any time during the time the meeting is on. The General Council du Nord have also decided to give a grant of 1,000 francs, while the Executive Committee of the L.N.A. will offer a prize of 1,250 francs, and the Northern Railway of France a prize of 1,000 francs.

Not all the prizes are for competition at the meeting next month. One of 1,000 francs, which has just been given by the Société Corderie, Ficellerie et Filature de Chanvre de Douai, will be awarded to the first aviator who shall make a flight of not less than 15 kiloms., officially timed, in a closed circuit at the Brayelle aerodrome, near Douai.

Flying Week at Anjou.

FOR the competition for aeroplanes, dirigibles, and balloons which are being organised to take place at Anjou during the week from July 11th to 18th, the Isle of Saint Aubin has been secured as an aerodrome. The ground has a superficial area of about 8 sq. kiloms., and a sum of 7,000 francs will be expended in putting the ground in order.

Wright Flyers for Student Pilots.

IN connection with its school for pilots, the Ligue National Aérienne have ordered a couple of Wright flyers, and one of them is expected to be delivered very shortly, while the other should arrive at the end of July. They will be placed under the charge of Capt. Ferber, but the lessons in the art of navigating them will be given by M. Tissandier.

M. Salvent at Provins.

M. DE SALVENT, who was slightly injured while making gliding experiments at Chalons some time ago, has now obtained permission from the military authorities to conduct his trials on the manoeuvre ground at Provins, where he has already commenced the construction of his hangar.

Givaudan Aeroplane.

A CURIOUS type of flying machine has just been constructed at the Vermorel works to the design of M. Givaudan. There are two sets of planes placed one at each end of the chassis, and each consists of two circular planes placed concentrically, the space between them being divided into eight cells by the same number of radial partitions. The front set of planes is so mounted that it can be moved in any direction for controlling the movement of the flying machine. It is propelled by a tractor-screw 2'4 metres in diameter driven by a 40-h.p. 8-cyl. Vermorel air-cooled motor of the "V" type, the bore and stroke of the motor being 90 x 120 mm.

View from a Flyer.

ALTHOUGH it is obvious that comparatively only a few people can have the privilege of a flight with Wilbur Wright, quite a large number will be able to see what the country round Centocelle looks like, from the point of view of a passenger on a Wright flyer. During one of the flights made by Wilbur Wright before the King of Italy, he was accompanied by a bioscope operator, and the film obtained is now included in the series of views shown by the Urbanora Co. at the Palace Theatre, London. It constitutes a complete panorama from the time the machine leaves the starting rail, passing over fields, aqueducts and Roman ruins, to the moment when the aeroplane came to rest before the Royal party.

An Auto-Aerodrome at Milan.

A PROJECT, involving an expenditure of about £640,000, is on foot for the construction of a combined motor racecourse and aerodrome in the Porte Victoire, suburb of Milan. The length of the racecourse will be 8'2 kiloms., made up of two level straights of 3'25 kiloms., joined by two semicircles of 625 metres radius. Along the straight portions the track will be 35 metres wide, increasing to 75 metres on the banking. Sheds for the housing of dirigible balloons are to be constructed at one end of the course.

Aeroplane Factory at Yarmouth.

IN response to the application by a London company, to which we referred recently, the Corporation of Yarmouth have decided to grant a seven years' lease of a site on the North Denes, about one-third of an acre in extent, on which an aeroplane factory will be erected. The aeroplanes will be tested over the adjacent marshes.

"Flag-Wagging" for Aviators.

Now there are so many people about who can fly, the question of being able to communicate one with another begins to assume importance. The Aero Club of France has appointed a Committee, consisting of MM. Barthou, Bleriot, Rousseau, H. Kapferer, and Captain Ferber, for the purpose of studying the subject of International signals to be used by aeronauts and aviators.

Competitions at the Paris Aero Show.

IT has been decided by the Aero Club de France to organise competitions in connection with the International Aero Show which is to be held in Paris next September.

At Pau.

A SITE about 500 metres in length and about 5 kiloms. from Pau on the Bordeaux road has been marked out for the erection of sheds for dirigible balloons. It seems to be generally expected that Pau will become a centre for the lighter-than-air branch of the sport, and that the Deutsch Prize for a flight from Pau to Pic du Midi and return will be won this year.

M. Clement Enters for the Deutsch Prize.

IT has been announced by the Aero Club of France that they have received from M. Clement an entry of his dirigible for the Coupe Henry Deutsch de la Meurthe, which was offered in 1906. The Cup consists of an *objet d'art* valued at 10,000 francs, and carries with it three prizes of 20,000 francs each, which will be awarded to the first three aviators who cover a closed circuit of 200 kiloms., passing over the terrace at St. Germain, Senlis, Meaux, Melun. Each successive winner of the Cup must improve by at least 10 per cent. upon the speed of the previous holder, and the Cup will become the property of the third holder. Competitors will be allowed to descend to take in supplies of petrol or gas, the start will be a "flying" one, and competitors need not necessarily descend at the completion of the 200 kiloms.

M. Clement has ordered from the Société Astra two new dirigibles, each having a capacity of 6,500 cubic metres.

German Aerial Liners.

REPRESENTATIVES of the Zeppelin Aerial Navigation Co. were last week at Lucerne, endeavouring to arrange for the erection of a shed big enough to house four Zeppelin airships. Two of the vessels are to be used in a regular service between Lucerne and Friedrichshafen,

and the other two will make trips in the neighbourhood. It is announced that the "line" will be ready for traffic in the spring of next year. In the meantime, proposals are being considered with regard to services to Berlin and other prominent cities in Germany, but the arrangements made will depend upon the facilities offered by the various municipal authorities.

German Airship Station in Gotha.

It is stated that Major Gross was recently despatched by the German Government to Gotha with a view to finding a suitable place for an airship landing place, on the direct route from Friedrichshafen to Berlin. It is probable that a station will be established at Gotha, for it stands on high ground, and the country round about is not encumbered by forest, so that landing there would not be difficult.

German Emperor and Zeppelin.

FROM information received from Berlin, there seems to be a possibility that in the event of the weather being favourable, the Kaiser will make an ascent in the Zeppelin airship, which is to be taken from Friedrichshafen to the capital as soon as a convenient opportunity arises. His Majesty has throughout taken the greatest interest in the airship, and is said recently to have expressed a wish to actually observe the process of manœuvring the vessel in the air.

Lighter Metal than Aluminium Wanted.

It has been calculated that if it were possible to dispense with one-third of the weight of the metal used in the framework of the Zeppelin airship, it would be possible to carry forty more persons than at present. In view of this, it has been decided to offer a prize in Germany for the discovery of a metal lighter than aluminium but of equal strength and durability for use in airship building.

Zeppelin Visit to Austria.

It is probable that the visit which is to be paid by the Zeppelin dirigible to Austria in order to allow the Emperor Francis Josef to inspect it and see it at work will take place in the middle of July, when the German Crown Prince will be visiting the Emperor. At that time, the Emperor will be staying at his summer residence at Ischl in the Tyrol.

An L.N. Centre at Arras.

A NEW centre of the Ligue Nationale has just been formed at Arras, as a branch of the go-ahead and enthusiastic Douai Section. The Mayor of Arras presided at the inaugural meeting, and M. Masson, chief engineer of highways and bridges, was elected President, MM. Blondel, Leprince and Ringuet, Vice-Presidents, with M. Lelong as Secretary, and Fourciz as Treasurer.

An Aero Club in Algeria.

AFTER a balloon chase by motor cars held in the neighbourhood of Algiers on the 9th inst., it was decided to form an Algerian Aero Club. M. Mortimer Singer was elected honorary president, and M. Maginot, a prominent Government official, was asked to become chairman, provisionally. Immediately the formation of the Club was decided upon, two balloons were offered to the Club by MM. Sneden and Viviers, two of the most active members of the Algerian A.C.

A Light 25-h.p. Engine Wanted.

AN English exhibitor at the recent Olympia Show, who was awarded a medal for the model which he exhibited there, has now completed a full-sized biplane of similar design, and is anxious to retain its all-British character by obtaining an engine for it from some

manufacturer in this country. His trouble is that "the engine my pocket could afford would probably be of foreign make;" and we need only add that his communication to ourselves also includes a request for advice on the subject of financial assistance. Is it impossible that some enterprising British firm of engine builders would supply, or at least loan one of their machines—a light engine capable of developing about 25 or 30-h.p.—on some mutually satisfactory basis whereby they would share with him any prize-money that may be won by the aeroplane in question?

Model Aeroplaning.

THREE subsidiary suggestions have been submitted to us by "one of those young Hopefuls who are at present constructing model aeroplanes on original lines." Referring to the letter from Mr. V. E. Johnson which appeared two weeks ago in our correspondence columns, this juvenile enthusiast at Winchester hails with delight the scheme for organising contests for schoolboys. He is already building a 4-foot machine, and his proposals are: that classification at these summer sports should be by plane-area; that some contests should be held at inland parks; and the prizes should take the form of models, tool-chests or cups, but should not be of a monetary character.

Communication with Mars.

DR. TODD, Professor of Astronomy at Amherst College, is, according to the *New York Times*, making great preparations for an attempt to get into communication with Mars during the month of September, when the planet will be nearest the earth. It is proposed to attain a record altitude in a balloon, and in order to accomplish this Dr. Todd proposes that he shall be shut in an aluminium box fitted with an

apparatus to drive out carbonic acid gas and supply oxygen. He hopes by this means to get high enough away from the noises and ether waves that surround the earth, and try to record on a wireless telegraph instrument electrical waves from Mars and the other planets.



David Ildred Nicholl
youngest member of
Aero Club League

An Early Recruit.—The Youngest "Life Member" of the Aero Club League, David Ildred Nicholl, ætat 2½, grandson of Mr. Frank H. Butler.

PRESENT STATUS OF MILITARY AERONAUTICS.

By GEORGE O. SQUIER, Ph.D., Major, Signal Corps, U.S. Army.

(Continued from page 270.)

Stability and Control.

The question of stability is a serious one in aviation, especially as increased wind velocities are encountered. In machines of the aeroplane type there must be some means provided to secure fore and aft stability and also lateral stability.

A large number of plans have been proposed for the accomplishment of these ends, some based upon the skill of the aviator, others operated automatically, and still others employing a combination of both. At the present time no aeroplane has yet been publicly exhibited which is provided with automatic control. There is little difference of opinion as to the desirability of some form of automatic control.

The Wright aeroplane does not attempt to accomplish this, but depends entirely upon the skill of the aviator to secure both lateral and longitudinal equilibrium, but it is understood that a

attention to guide his machine, yet he is travelling on a roadway where he can have due warning, through sight, of the turns and irregularities of the course.

The fundamental difference between operating the aeroplane and the automobile, is that the former is travelling along an aerial highway which has manifold humps and ridges, eddies and gusts, and, since the air is invisible, he cannot see these irregularities and inequalities of his path, and consequently cannot provide for them until he has actually encountered them. He must feel the road since he cannot see it.

Some form of automatic control whereby the machine itself promptly corrects for the inequalities of its path is evidently very desirable. As stated above, a large number of plans for doing this have been proposed, many of them based on gyrostatic action, movable side planes, revolving surfaces, warped surfaces, &c. A solution of this problem may be considered as one of the next important steps forward in the development of the aeroplane.

III. HYDROMECHANIC RELATIONS.

SOME GENERAL RELATIONS BETWEEN SHIPS IN AIR AND WATER.

At the present moment so many minds are engaged upon the general problem of aerial navigation that any method by which a broad forecast of the subject can be made is particularly desirable. Each branch of the subject has its advocates, each believing implicitly in the superiority of his method. On the one hand the adherents of the dirigible balloon have little confidence in the future of the aeroplane, while another class have no energy to devote to the dirigible balloon, and still others prefer to work on the pure helicopter principle. As a matter of fact, each of these types is probably of permanent importance, and each particularly adapted to certain needs.

Fortunately for the development of each type, the experiments made with one class are of value to the other classes, and these in turn bear close analogy to the types of boats used in marine navigation. The dynamical properties of water and air are very much alike, and the equations of motion are similar for the two fluids, so that the data obtained from experiments in water, which are very extensive, may with slight modification be applied to computations for aerial navigation.

Helmholz' Theorem.—Von Helmholtz, the master physicist of Germany, who illuminated everything he touched, has fortunately considered this subject, in a paper written in 1873. The title of his paper is "On a theorem relative to movements that are geometrically similar in fluid bodies, together with an application to the problem of steering balloons."

In this paper, Helmholtz affirms that, although the differential equations of hydro-mechanics may be an exact expression of the laws controlling the motions of fluids, still, it is only for relatively few and simple experimental cases that we can obtain integrals appropriate to the given conditions, particularly if the cases involve viscosity and surfaces of discontinuity.

Hence, in dealing practically with the motion of fluids, we must depend upon experiment almost entirely, often being able to predict very little from theory, and that usually with uncertainty. Without integrating, however, he applies the hydrodynamic equations to transfer the observations made on any one fluid with given models and speeds, over to a geometrically similar mass of another fluid involving other speeds, and models of different magnitudes. By this means he is able to compute the size, velocity, resistance, power, &c., of aerial craft from given, or observed, values for marine craft.

He also deduces laws that must inevitably place a limit upon the possible size and velocity of aerial craft without, however, indicating what that limit may be with artificial power. Applying this mode of reasoning to large birds he concludes by saying that, "It therefore appears probable that in the model of the great vulture, nature has already reached the limit that can be attained with the muscles as working organs, and under the most favourable conditions of subsistence, for the magnitude of a creature that shall raise itself by its wings and remain a long time in the air."

In comparing the behaviour of models in water and air, he takes account of the density and viscosity of the media, as these were well known at the date of his writing, 1873; but he could not take account of the sliding, or skin-friction, because in his day neither the magnitude of such friction for air, nor the law of its variation with velocity had been determined.

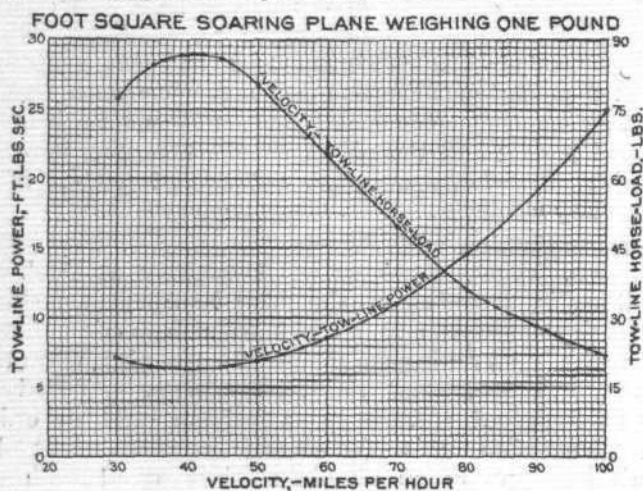


Diagram C.

device for this purpose is one of the next to be brought forward by them. Much of the success of the Wright Brothers has been due to their logical procedure in the development of the aeroplane, taking the essentials, step by step, rather than attempting everything at once, as is so often the practice with experienced inventors.

The aviator's task is much more difficult than that of the chauffeur. With the chauffeur, while it is true that it requires his constant

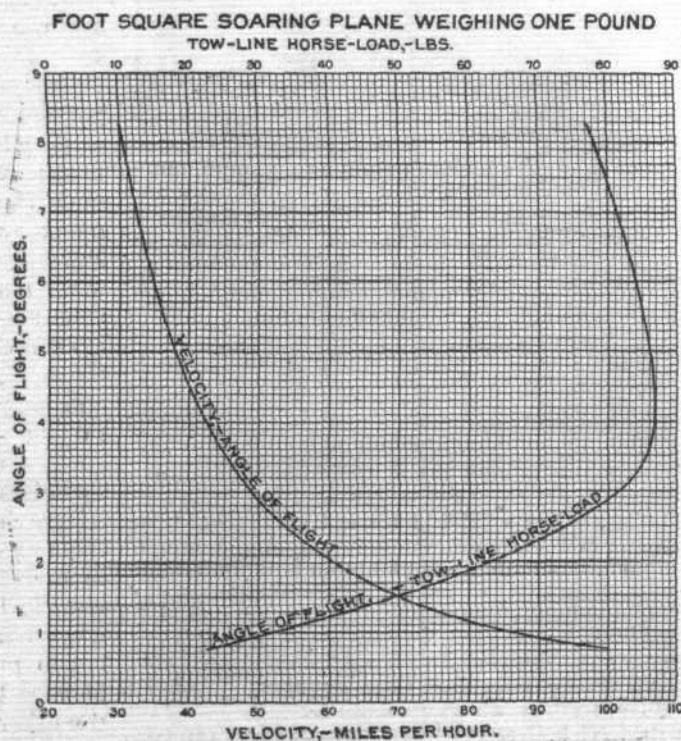


Diagram D.

Skin-Friction in Air.

Even as late as Langley's experiments, skin-friction in air was regarded as a negligible quantity, but due to the work of Dr. Zahm, who was the first to make any really extensive and reliable experiments on skin-friction in air, we now can estimate the magnitude of this quantity. As a result of his research he has given in his paper on atmospheric friction the following equation:—

$$f = 0.00000778 l - 0.07 v^{1.85} \dots (v = \text{ft.-sec.}),$$

$$f = 0.0000158 l - 0.07 v^{1.85} \dots (v = \text{m.p.h.})$$

in which f is the average skin-friction per square foot, and l the length of surface.

From this equation the accompanying table of resistances was computed, and is inserted here for the convenience of engineers:—

TABLE 2.—Friction per square foot for various speeds and lengths of surface.

Wind Speed.	Average Friction in lbs. per sq. ft.					
	1-ft. Plane.	2-ft. Plane.	4-ft. Plane.	8-ft. Plane.	16-ft. Plane.	32-ft. Plane.
m.p.h.						
5	0.000303	0.000289	0.000275	0.000262	0.000250	0.000238
10	0.00112	0.00105	0.00101	0.000967	0.000922	0.000878
15	0.00237	0.00226	0.00215	0.00205	0.00195	0.00186
20	0.00402	0.00384	0.00365	0.00349	0.00332	0.00317
25	0.00606	0.00579	0.00551	0.00527	0.00501	0.00478
30	0.00850	0.00810	0.00772	0.00736	0.00701	0.00668
35	0.01130	0.0108	0.0103	0.0098	0.00932	0.00888
40	0.0145	0.0138	0.0132	0.0125	0.0118	0.0114
50	0.0219	0.0209	0.0199	0.0190	0.0181	0.0172
60	0.0307	0.0293	0.0279	0.0265	0.0253	0.0242
70	0.0407	0.0390	0.0370	0.0353	0.0337	0.0321
80	0.0522	0.0500	0.0474	0.0452	0.0431	0.0411
90	0.0650	0.0621	0.0590	0.0563	0.0536	0.0511
100	0.0792	0.0755	0.0719	0.0685	0.0652	0.0622

The numbers within the rules represent data coming within the range of observation. These observations show that "the frictional resistance is at least as great for air as water, in proportion to their densities. In other words, it amounts to a decided obstacle in high-speed transportation. In aeronautics it is one of the chief elements of resistance both to hull-shaped bodies and to aero-surfaces gliding at small angles of flight.

Relative Dynamic and Buoyant Support.—Peter Cooper-Hewitt has given careful study to the relative behaviour of ships in air and in water. He has made a special study of hydroplanes, and has prepared graphic representations of his results which furnish a valuable forecast of the problem of flight.

Without knowing of Helmholtz's theorem, Cooper-Hewitt has independently computed curves for ships and hydroplanes from actual data in water, and has employed these curves to solve analogous problems in air, using the relative densities of the two media, approximately 800 to 1, in order to determine the relative values of support by dynamic reaction and by displacement for various weights and speeds.

An analysis of these curves leads to conclusions of importance, some of which are as follows:—

The power consumed in propelling a displacement vessel at any constant speed, supported by air or water, is considered as being two-thirds consumed by skin-resistance, or surface resistance, and one-third consumed by head resistance. Such a vessel will be about ten diameters in length, or should be of such shape that the sum of the power consumed in surface friction and in head resistance will be a minimum (torpedo shape).

The power required to overcome friction due to forward movement will be about one-eighth as much for a vessel in air as for a vessel of the same weight in water.

Leaving other things out of consideration, higher speeds can be obtained in craft of small tonnage by the dynamic reaction type than by the displacement type, for large tonnages the advantages of the displacement of type are manifest.

A dirigible balloon carrying the same weight, other things being equal, may be made to travel about twice as fast as a boat for the same power; or to be made to travel at the same speed with the expenditure of about one-eighth of the power.

As there are practically always currents in the air reaching at times a velocity of many miles per hour, a dirigible balloon should be constructed with sufficient power to be able to travel at a speed of about 50 m.p.h., in order that it may be available under practical conditions of weather. In other words, it should have

substantially as much power as would drive a boat, carrying the same weight, 25 miles an hour, or should have the same ratio of power to size as the "Lusitania."

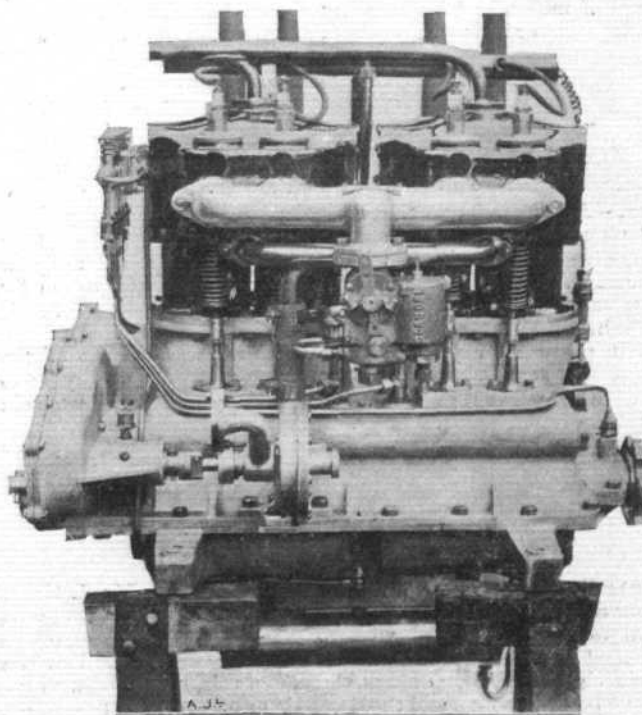
Motors.—It is the general opinion that any one of several types of internal combustion motors at present available is suitable for use with dirigible balloons. With this type, lightness need not be obtained at the sacrifice of efficiency. In the aeroplane, however, lightness per output is a prime consideration, and certainty and reliability of action is demanded, since, if by chance the motor stops, the machine must immediately glide to the earth. A technical discussion of motors would of itself require an extended paper, and may well form the subject of a special communication.

Propellers.—The fundamental principles of propellers are the same for air as for water. In both elements, the thrust is directly proportional to the mass of fluid set in motion per second. A great variety of types of propellers have been devised, but, thus far, only the screw-propeller has proved to be of practical value in air. The theory of the screw-propeller in air is substantially the same as for the deeply submerged screw-propeller in water, and therefore does not seem to call for treatment here. There is much need at present for accurate aerodynamic data on the behaviour of screw-propellers in air, and it is hoped that engineers will soon secure such data, and present it in practical form for the use of those interested in airship design.

Limitations.—Euclid's familiar "square-cube" theorem connecting the volumes and surfaces of similar figures, as is well known, operates in favour of increased size of dirigibles, and limits the possible size of heavier-than-air machines in single units and with concentrated load.

It appears, however, that both fundamental forms of aerial craft will likely be developed, and that the lighter-than-air type will be the burden-bearing machine of the future, whereas the heavier-than-air type will be limited to comparatively low tonnage, operating at relatively high velocity. The helicopter type of machine may be considered as the limit of the aeroplane, when by constantly increasing the speed, the area of the supporting surfaces is continuously reduced until it practically disappears. We may then picture a racing aeroplane propelled by great power, supported largely by the pressure against its body, and with its wings reduced to mere fins which serve to guide and steady its motion. In other words, starting with the aeroplane type, we have the dirigible balloon on the one hand as the tonnage increases, and the helicopter type on the other extreme as the speed increases. Apparently, therefore, no one of these forms will be exclusively used, but each will have its place for the particular work required.

(To be continued.)



The Vinot Aero-Motor is of the orthodox 4-cyl. type. Its cylinders have a bore and stroke of 103 mm. by 130 mm., and develop from 36 h.p. at 1,000 r.p.m. to 47 h.p. at 1,600 r.p.m. Without a fly-wheel, but with the carburettor and other usual accessories, the weight is 156 kilograms.

CORRESPONDENCE.

* * The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion, or containing queries.

WRIGHT BROTHERS' PATENTS.

To the Editor of FLIGHT.

SIR,—With reference to the Wright Brothers' patents it may interest you to know that as far back as July, 1903, I demonstrated at 11, King Street, St. James, to Eric Stuart Bruce, Esq., late Secretary to the Aeronautical Society, with a model monoplane made of black paper and wire, showing how an aeroplane machine could be steered to right or left, raised or lowered, by simply warping the tail and wings of the machine. To demonstrate the idea, I ran the machine along a wire on a pulley, and according to which wing was warped, and the position of the tail, so the machine was steered to right or left, or raised or lowered. Unfortunately I had to let the matter drop for lack of funds.

Yours faithfully,

WILLIAM COCHRANE.

A PHOTOGRAPHIC COLLECTION.

To the Editor of FLIGHT.

SIR,—I have just been able to obtain from France one or two complete sets of the aeroplane pictures similar to those presented by me to the Motor Club. I have been asked by so many people if I could obtain similar sets, that I have taken the matter up with France, and have now received other copies.

I shall be glad to forward a set to anyone requiring same if they will communicate with me, and enclose a cheque for £1 10s.

The pictures are as follows:—

1. Le dirigible "Ville de Paris."
2. Henri Farman sur son aeroplan.
3. "En Reconnaissance"—Bayard-Clement.
4. Le dirigible "Republique"—Panhard and Levassor.
5. Le dirigible "Zeppelin."
6. Wright au camp d'Auvours.

The seventh picture is not named.

Yours faithfully,

CHAS. JARROTT.

COST OF DIRIGIBLES.

To the Editor of FLIGHT.

SIR,—Could you, or any of your readers, give me the approximate cost of building a dirigible balloon capable of carrying six people, the cost of motor, and horse-power required to drive it, also the amount of gas or hydrogen required, and approximate cost of both for filling it.

Yours faithfully,

"BOBOLINK."

MODEL MOTORS AND WRIGHT FLYERS.

To the Editor of FLIGHT.

SIR,—Re motors for models, I wonder if any of your readers have tried phonograph clockwork motors for models; if so, would they kindly give their experiences with same through the medium of your columns. As these motors are for the most part able to run for ten minutes without rewinding, they should, in my opinion, if their weight be not too excessive, be very suitable for small models.

Is it possible for you to give the exact measurements of the Wright flyers, as I should like to make a small model of same to scale. Also, why not give articles on how to build small flyers in the pages of your valued weekly.

Yours faithfully,

ATHOL R. ANGUS.

MODELS AT OLYMPIA.

To the Editor of FLIGHT.

DEAR SIR,—Will you kindly allow me to answer Mr. J. Gaunt in your current issue, as he has put forward a misconception with regard to my machine. I wish to point out to him and others concerned that there is a powerful vacuum created behind and on top of each forward edge of each plane, and this, combined with the pressure below, does compel the spent air to pass through the spaces, with the effect that, although each plane is in the same general plane, there is no loss of lift. It is not a question of "expectations" at all. It is what the model has done. It has lifted itself and a weight equal to its own weight attached with only one of the two planes fitted, and has kept a level keel, although a "length on" machine.

Mr. Gaunt, with the vast majority of aviators, labours under the idea that every inch of plane must be made to lift. I maintain, and have proved with my model, that by having transverse spaces, to the extent of half the lifting surface, or even more, an absolutely fresh stratum of air is presented to each plane (of which there are thirty), and therefore the lift effort is just as great, and perhaps more, as if it were all plane surface.

If Mr. Gaunt will take a piece of cardboard, say 6 ins. by 10 ins., and cut $\frac{1}{2}$ -in. or $\frac{3}{4}$ -in. spaces in it, and blow smoke from a pipe on it at an angle of 8° he will soon see that the air goes through.

Faithfully yours,

E. H. HARE.

Varnton, May 3rd.

SIR,—Though your correspondent, Mr. E. H. Hare, seems to be somewhat impatient of criticism, I should like to remind him that Sir H. S. Maxim, in 1889, found by experiment that when several aeroplanes are used one behind the other the greater part of the work is done by the leading plane, for the reason that it works in air that has not been disturbed. It follows, therefore, that any plane set immediately behind, and in a straight line with the leading plane, is working under bad conditions, and its efficiency is thereby seriously impaired.

If the air could be "let through" as Mr. E. H. Hare would like, leaving undisturbed air ready for the plane following, Sir H. S. Maxim would obviously have forestalled Mr. E. H. Hare's invention years ago. Unfortunately, the air will not act in so convenient a manner, and instead of going up through the space provided, it remains in rear of the leading plane tying itself into knots and obstructing plane No. 2 in the execution of its duty.

In his criticism of the "broadside-on" travel of aeroplanes, Mr. Hare quotes several examples in support of his opposition to that mode of progression, among which he mentions the fish, but, strangely enough, ignores the birds and everything else that moves through the air using it as a support.

I see by Mr. E. H. Hare's "P.S." that he possesses—in common with most of us—the conviction that he would know exactly what to do with other people's money if it were his.

For my part I am confident that if Mr. Hare, or anyone else, could prove that they had an idea for the construction of a flyer superior to any existing machine, capitalists would fall over each other in their eagerness to finance him. But they would want some proof. Nobody but a fool would part with his money having only the bare assertion of an inventor as security.

Yours truly,

P. L. HOLDSWORTH.



Aeronautical Patents Published.

Applied for in 1908.

Published May 13th, 1909.

28,547. O. KRAUSZ. Dirigible or controllable airships.

Applied for in 1909.

Published May 13th, 1909.

8,198. L. SAUVAL AND P. LEULLIEUX. Aerial toy.

Published May 20th, 1909.

2,572. — ROBINSON. Kites, aeroplanes, and like apparatus.

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